ZZW
AF

HDP/SB/21 based on PTO/SB/21 (08-00)

Please type a plus sign (+) inside this box → ☐+

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	**10/608,086**
Filing Date	June 30, 2003
Inventor(s)	William E. RUSSELL, II et al.
Group Art Unit	3663
Examiner Name	Rick Palabrica
Attorney Docket Number	24GA05998-7

ENCLOSURES *(check all that apply)*

- ☐ Fee Transmittal Form
  - ☐ Fee Attached
- ☐ Amendment
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
- ☐ Express Abandonment Request
- ☐ Information Disclosure Statement
- ☐ Certified Copy of Priority Document(s)
- ☐ Response to Missing Parts/ Incomplete Application
- ☐ Response to Missing Parts under 37 CFR 1.52 or 1.53
- ☐ Assignment Papers *(for an Application)*
- ☐ Letter to the Official Draftsperson and _____ Sheets of Formal Drawing(s)
- ☐ Licensing-related Papers
- ☐ Petition
- ☐ Petition to Convert to a Provisional Application
- ☐ Power of Attorney, Revocation Change of Correspondence Address
- ☐ Terminal Disclaimer
- ☐ Request for Refund
- ☐ CD, Number of CD(s) _____
- ☐ After Allowance Communication to Group
- ☒ REPLY BRIEF (w/clean version of pending claims)
- ☐ Appeal Communication to Group *(Notice of Appeal)*
- ☐ Proprietary Information
- ☐ Status Letter
- ☐ Other Enclosure(s) *(please identify below)*:

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm *or* Individual name	Harness, Dickey & Pierce, P.L.C.	Attorney Name Gary D. Yacura	Reg. No. 35,416
Signature			
Date	October 13, 2006		

(HDP Ref: 8564-000045/US/DVA)

PATENT APPLICATION

IN THE U.S. PATENT AND TRADEMARK OFFICE

Appellants:	William E. RUSSELL, II, et al.
Application No.:	10/608,086
Art Unit:	3641
Filed:	June 30, 2003
Examiner:	Ricardo Palabrica
For:	SYSTEM AND METHOD FOR CONTINUOUS OPTIMIZATION OF CONTROL VARIABLES DURING OPERATION OF A NUCLEAR REACTOR
Attorney Docket No.:	24GA05998-7 (HDP Ref: 8564-000045/US/DVA)

REPLY BRIEF UNDER 37 C.F.R. § 41.50(a)(2)(ii) and 41.41

Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314
Mail Stop Appeal Brief - Patents

October 13, 2006

Sir:

Responsive to the Examiner's Answer mailed August 15, 2006, Appellants request that the appeal be maintained and supply the following arguments in reply.

I. REAL PARTY IN INTEREST:

Appellants note the Examiner's recognition of the real party in interest.

II. RELATED APPEALS AND INTERFERENCES:

Appellants note the Examiner's recognition that no known appeals or interferences are related to the subject appeal.

III. STATUS OF CLAIMS:

The status of the claims is now as follows:

Claims 31-41 are pending in the application, with claim 31 being written in independent form.

Claims 31-39 have been rejected under 35 U.S.C. § 103 as being unpatentable over Musick in view of "Winning Strategies for Maintenance Optimization at U.S. NPPs" from the Nuclear Plant Journal Editorial Archive, hereinafter referred to as the "Nuclear Plant Journal."

Claims 40-41 have been rejected under 35 U.S.C. § 103 as being unpatentable over Musick in view of the Nuclear Plant Journal and further in view of Takeuchi.

Claims 31-41 are being appealed.

IV. STATUS OF AMENDMENTS:

Appellants note with appreciation the Examiner's confirmation that the status of amendments set forth in the Appeal Brief is correct.

V. SUMMARY OF CLAIMED SUBJECT MATTER:

Appellants note with appreciation the Examiner's indication that the Summary of the Claimed Subject Matter set forth in the Appeal Brief is correct.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL:

The grounds of rejection to be reviewed on appeal is now as follows:

Appellants seek the Board's review of (1) the rejection of claims 31-39 under 35 U.S.C. § 103 as being unpatentable over Musick in view of the Nuclear Plant Journal; and (2) the rejection of claims 40-41 under 35 U.S.C. § 103 as being unpatentable over Musick in view of the Nuclear Plant Journal and further in view of Takeuchi.

VII. ARGUMENTS:

A. Appellants traverse the rejection of claims 31-39 under 35 U.S.C. § 103 as being unpatentable over Musick in view of the Nuclear Plant Journal.

Claims 31-39 rise and fall together.

i) Claim 31

The Examiner states on page 5 of the August 15, 2006 Examiner's Answer:

> The examiner has discussed in the Examiner's Answer of November 2, 2005, how Musick's computerized method of controlling a nuclear reactor achieves maximization of plant capacity and availability within acceptable fuel design limits, under normal operation and anticipated operational occurrences.
>
> The issue raised by the Board in its remand is whether this maximization of plant capacity and availability within acceptable design limits achieves optimization within those limits (see page 4, 2nd paragraph of the remand).

Appellants disagree with the Examiner's characterization of the issue raised by the Board. On page 4 of the May 25, 2006 Board decision, the Board states:

> The portion of Musick relied upon by the examiner discloses that"[i]n the art of reactor control the objectives to be achieved are the maximization of plant capacity and availability without violating the specified acceptable fuel design limits as a result of normal operation and anticipated operational occurrences" (col. 8, lines 24-28). Musick

> determines the design limits (col. 6, lines 15-18). The examiner has not established that Musick discloses, or would have fairly suggested, to one of ordinary skill the art, determining the optimum within those limits.

The Board on page 5 of the May 25, 2006 decision goes on to state:

> We therefore remand the application to the examiner to determine whether prior art is available that discloses, or would have fairly suggested, to one of ordinary skill in the art, performing a computerized optimization process of a nuclear reactor to generate, from received state-point data, one or more independent control variable values.

The Board clearly concurs with Appellants that Musick only teaches determining design limits and detecting violation of those design limits - NOT determining optimization within those limits.

On page 5 of the August 15, 2006 Examiner's Answer, the Examiner then points to col. 4, line 37+ of Musick and asserts from this passage on page 6:

> Clearly, Musick's maximization of plant capacity and availability within design limits optimizes ONLY selected parameters and NOT all parameters, because changing one parameter inherently causes change in some other parameters.

Other than the passage in col. 4, lines 27-56 of Musick using the word "optimization," this passage does not teach optimizing any parameters. Instead, this passage states that prior art to Musick established

independent design limits such that one parameter could deviate from its optimum value, without causing an approach to the design limit.

As will be recalled from the Appeal Brief[1], Musick discloses in column 23, lines 40-47 that the core operating limit supervisory system (COLSS) calculates a reactor core operating limit, and that this limit provides a sufficient margin to the design limits to allow the core protector calculator to respond to an incident and terminate the reactor core chain reaction before the design limits are violated.

On page 5 of the November 7, 2005 Examiner's Answer, the Examiner characterizes Musick by stating:

> Based on some sensor signals, COLSS makes an accurate calculation of a DNBR operating limit that can be utilized to control reactor operation: a) register the limit on visual indicator 170 to allow an operator to operate the reactor within specified limits; and 2) automatically restrict the plant power within limits (see col. 12, lines 8+).

As this discussion reveals, Musick provides for rendering the reactor non-functional, or at the very most, barely functional. This can hardly be characterized as optimization, which according to the Examiner's newest definition[2] would make reactor operation reasonably fully perfect or fully functional.

---

[1] See page 15 of the October 18, 2005 Appeal Brief.
[2] See page 5 of the August 15, 2006 Examiner's Answer.

Remember, col. 8, lines 24+ of Musick state:

> In the art of reactor control the objectives to be achieved are the maximization of plant capacity and availability without violating the specified acceptable fuel design limits as a result of abnormal operation and anticipated operational occurrences.

Musick, contrary to the Examiner's assumption, is not directed towards maximizing plant capacity and availability. Instead, Musick is directed towards the latter part of the above quotation, which is to say that Musick is concerned with detecting violation of specified acceptable fuel design limits. This is further supported in col. 5, lines 57-60 of Musick in which it is stated that:

> The instant invention involves a supervisory apparatus and method whose function is to ensure that a nuclear reactor is operated within specified operating limits.

Therefore, Appellants would like to reiterate that Musick concerns making the reactor become non-functional or barely functional so that design limits are not exceeded and does not provide for optimal reactor performance. Therefore, Musick does not disclosure or suggest "[a] method of determining independent control variable values for a nuclear reactor under operation, comprising:...performing an optimization process on one of a computer and computer network based on the received state-point data to generate one or more independent control variable values," as recited in claim 31.

Next, the Examiner introduces the newly cited Nuclear Plant Journal on page 6 of the August 15, 2006 Examiner's Answer stating:

> Nuclear Plant Journal teaches several maintenance optimization strategies that have a common goal of increasing reliability and plant availability while reducing cost.

Actually, the Nuclear Plant Journal mentions that such maintenance strategies exist, but does not teach how to perform any of the strategies. In large part these maintenance strategies are discussed as methods for avoiding fixed frequency maintenance or avoiding maintenance during reactor shut down. There is no teaching in the Nuclear Plant Journal of "[a] method of determining independent control variable values for a nuclear reactor under operation, comprising:...performing an optimization process on one of a computer and computer network based on the received state-point data to generate one or more independent control variable values," as recited in claim 31.

Furthermore, Appellants fail to see what teaching in the Nuclear Plant Journal the Examiner is combining with Musick. The Examiner states:

> The secondary reference clearly demonstrates the clear nexus between optimization and maximum plant availability.

(See Page 6 of the August 15, 2006 Examiner's Answer).

Actually, the Nuclear Plant Journal makes the case that if the reactor does not need to be shut down as often to perform maintenance, the reactor become more available. This fails to teach or suggest "[a] method of determining independent control variable values for a nuclear reactor under operation, comprising:...performing an optimization process on one of a computer and computer network based on the received state-point data to generate one or more independent control variable values," as recited in claim 31.

Therefore, even if the Nuclear Plant Journal were combined with Musick, the resulting combination fails to disclose or suggest at least this limitation of claim 31. Namely, the Examiner has not shown prior art is available that discloses, or would have fairly suggested, to one of ordinary skill in the art, performing a computerized optimization process of a nuclear reactor to generate, from received state-point data, one or more independent variable values.

Furthermore, the Examiner has failed to met his burden of providing sufficient motivation for combining the Nuclear Plant Journal with Musick. The Examiner states:

> The examiner has previously shown that Musick's computerized control process generates one or more independent control variables from received state-point data (See Examiner answer, page 5). Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to have considered Musick's control process as an optimization that maximizes plant capacity and availability within acceptable fuel design, based on the teaching of Nuclear Plant Journal.
>
> (See page 6 of the August 15, 2006 Examiner's Answer).

The Examiner has failed to explain why an article on the benefit of reactor maintenance techniques would have been combined with a patent on shutting down a reactor in violation of design limits. Furthermore, the Board has already concluded that the Examiner has misinterpreted the Musick patent and that Musick does not teach "[a] method of determining independent control variable values for a nuclear reactor under operation, comprising:...performing an optimization process on one of a computer and computer network based on the received state-point data to generate one or more independent control variable values," as recited in claim 31.

Therefore, Appellants further submit that the Examiner has failed to provide sufficient motivation for combining Musick and the Nuclear Plant Journal, and that a prima facie case of obviousness has not and can not be established based on Musick in view of the Nuclear Plant Journal.

ii) Claims 32-39

Claims 32-39, dependent upon claim 31, are patentable at least for the reasons stated above with respect to claim 31 as well as on their own merits.

B. Appellants traverse the rejection of claims 40-41 under 35 U.S.C. § 103 as being unpatentable over Musick in view of the Nuclear Plant Journal and further in view of Takeuchi.

Claims 40 and 41 rise and fall together.

i) Claim 40

As demonstrated above, Musick in view of the Nuclear Plant Journal fails to render claim 31 obvious to one skilled in the art. And, as concluded by the Board in the decision dated May 25, 2006, Takeuchi also fails to disclose or suggest the limitations of claim 31 discussed above with respect to Musick in view of the Nuclear Plant Journal. Therefore, Musick in view of the Nuclear Plant Journal and Takeuchi can not render claim 31 obvious to one skilled in the art. Claim 40, dependent on claim 31, is patentable at least for the reasons stated above with respect to claim 31.

Furthermore, as before, the Examiner is relying on Takeuchi as teaching the generating of transfer functions recited in claim 40. In particular, in the Examiner's Answer of November 7, 2005, the Examiner states on page 8:

> The limitation, "transfer function representing functional relationships between independent control variables and the dependent performance variables" reads on the algorithm that functionally relates the independent variables (e.g., pressurizer level) to the dependent variables (e.g., plant abnormal condition).

Stated another way, the Examiner is reading the transfer functions recited in claim 40 on pre-programmed relationships in the algorithm of Takeuchi. By contrast, claim 40 recites "generating transfer functions ...." Simply put, Takeuchi does not generate transfer functions. At best, Takeuchi uses predefined relationships, but does not "generate transfer functions based on the sets of independent control variable values and the sets of dependent performance variable values, the transfer functions representing functional relationships between the independent control variables and the dependent performance variables," as recited in claim 40. It should also be noted that claim 40 recites obtaining the dependent performance variables from simulations, and this limitation in conjunction with the generation of transfer functions is also missing from Takeuchi.

Therefore, Musick in view of the Nuclear Plant Journal and Takeuchi can not render claim 40 obvious to one skilled in the art.

ii) Claim 41

Claim 41, dependent on claim 40, is patentable at least for the reasons stated above with respect to claim 40.

X. CONCLUSION:

Appellants respectfully request the Board to reverse the Examiner's obviousness rejections of claims 31-41.

The Commissioner is authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,
HARNESS, DICKEY, & PIERCE, P.L.C.

By: _____
Gary D. Yacura
Reg. No. 35,416

GDY:jcp

P.O. Box 8910
Reston, Virginia 20195
(703) 668-8000

APPENDIX A - CLAIMS APPENDIX

Claims 31-41 on Appeal:

Claim 31. A method of determining independent control variable values for a nuclear reactor under operation, comprising:

receiving state-point data for the operating nuclear reactor, the state-point data including current values for independent control variables and for dependent performance variables of the operating nuclear reactor; and

performing an optimization process on one of a computer and computer network based on the received state-point data to generate one or more independent control variable values.

Claim 32. The method of claim 31, further comprising:

receiving a change in at least one constraint of the nuclear reactor operation; and wherein

the performing step performs the optimization process on one of a computer and computer network based on the received state-point data and the at least one changed constraint.

Claim 33. The method of claim 32, further comprising:

executing the performing step in response to receiving state-point data that differs from previously received state-point data.

Claim 34. The method of claim 31, further comprising:

executing the performing step in response to receiving state-point data that differs from previously received state-point data.

Claim 35. The method of claim 31, further comprising:

repeating the receiving and performing steps throughout operation of the operating nuclear reactor.

Claim 36. The method of claim 35, further comprising:

executing the performing step in response to receiving state-point data that differs from previously received state-point data.

Claim 37. The method of claim 31, further comprising:

displaying at least a portion of the state-point data.

Claim 38. The method of claim 37, further comprising:

displaying at least a portion of results from the performing step.

Claim 39. The method of claim 31, further comprising:

displaying at least a portion of results from the performing step.

Claim 40. The method of claim 31, wherein the optimization process comprises:

first simulating nuclear reactor operation for sets of independent control variable values to produce associated sets of dependent performance variable values;

generating transfer functions based on the sets of independent control variable values and the sets of dependent performance variable values, the transfer functions representing functional relationships between the independent control variables and the dependent performance variables; and

determining a set of independent control variable values for possible use in operating the operating nuclear reactor using the transfer functions.

Claim 41. The method of claim 40, wherein the first simulating step comprises:

treating the independent control variable values and the dependent performance variable values in the state-point data as a base set of independent control variable values and a base set of dependent performance variable values, respectively;

generating, from the base set of independent control variable values, modified sets of independent control variable values associated with each

independent control variable in a selected group of independent control variables; and

simulating nuclear reactor operation for each of the modified sets of independent control variable values to produce modified sets of dependent performance variable values.

APPENDIX B – RELATED APPEALS AND INTERFERENCES APPENDIX

No related appeals or interferences are known.

APPENDIX C – EVIDENCE SUBMITTED UNDER CFR 1.130, 1.131, OR 1.132

None.

APPENDIX D – DECISIONS RENDERED BY THE COURT OR THE BOARD IN RELATED APPEALS AND INTERFERENCES SECTION

None.